JAPANESE PATENT OFFICE

PATENT ABSTRACTS OF JAPAN

(11) Publication number: **06318535 A**

(43) Date of publication of application: **15.11.94**

(51) Int. Cl **H01G 9/02**
H01G 13/00

(21) Application number: **03072311**

(22) Date of filing: **11.03.91**

(71) Applicant: **J C C ENG KK CKD CORP**

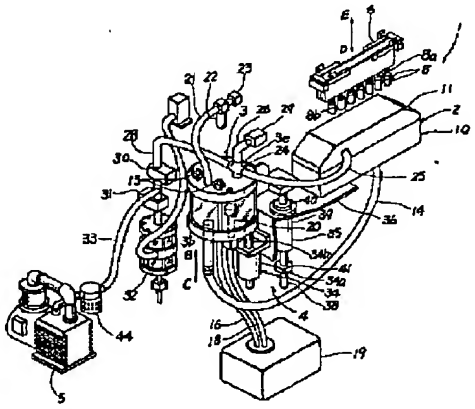
(72) Inventor: **KOMATA KATSUMORI**

(54) **METHOD AND APPARATUS FOR VACUUM ELECTROLYTE INPREGNATION FOR ELECTROLYTIC CAPACITOR ELEMENT**

(57) Abstract:

PURPOSE: To keep clean an electrolytic capacitor automatic assembling machine and moreover improve solderability by supplying the vacuum debubbled electrolyte to a vacuum impregnation tank under the same vacuum degree in order to improve impregnation efficiency of the electrolyte and to perfectly prevent adhesion of electrolyte on lead wires and adhesive tapes through suppression of the boiling phenomenon of vacuum debubbled electrolyte and mixture of bubbles.

CONSTITUTION: The electrolyte is vacuum debubbled to eliminate air content within a reservoir tank 3 under the vacuum condition. Thereafter, the reservoir tank 3 is moved upward to supply the electrolyte to a vacuum impregnation tank 2 under the same vacuum degree from the reservoir tank 3 utilizing the difference of height in view of impregnating an electrolytic capacitor element 8 with the electrolyte.



(19)日本国特許庁（ＪＰ）　(12) **公開特許公報**（Ａ）　(11)特許出願公開番号

特開平6－318535

(43)公開日　平成６年(1994)11月15日

(51)Int.Cl.[5]		識別記号	庁内整理番号	Ｆ Ｉ	技術表示箇所
Ｈ０１Ｇ	9/02	３１１	7354－5E		
	13/00	３７１　Ｈ	9174－5E		

審査請求　有　　請求項の数２　ＦＤ　（全 ７ 頁）

(21)出願番号　特願平3－72311

(22)出願日　平成３年(1991)３月11日

(71)出願人　000107240
ジェーシーシーエンジニアリング株式会社
東京都秋川市二宮東３丁目３番地３

(71)出願人　000106760
シーケーディ株式会社
愛知県小牧市大字北外山字早崎3005番地

(72)発明者　小俣　勝森
東京都秋川市二宮東３丁目３番地３ジェーシーシーエンジニアリング株式会社内

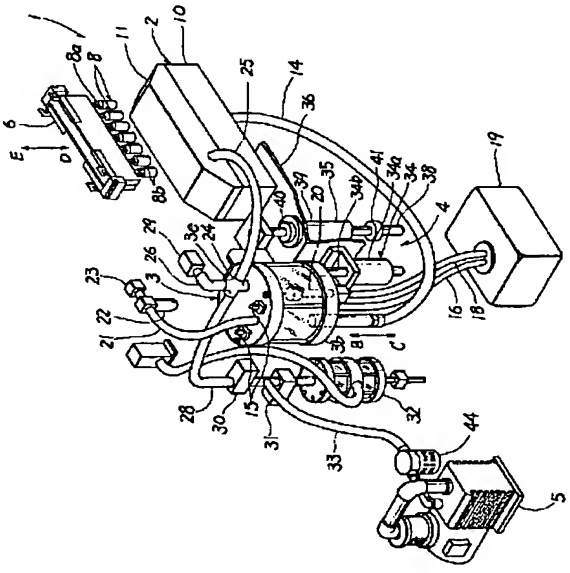
(74)代理人　弁理士　内田　和男

(54)【発明の名称】　電解コンデンサ素子の電解液真空含浸方法及び装置

(57)【要約】

【目的】　真空脱泡された電解液を同一真空度で真空含浸槽に供給し、真空脱泡された電解液の沸騰現象及び気泡の混入を抑制して電解液の含浸効率を向上させると共にリード線及び粘着テープ等に電解液が付着するのを完全に防止して電解コンデンサ自動組立機を清浄な状態に保持し、更に半田付け性能を向上させる。

【構成】　真空とした貯溜槽内で電解液中の空気を真空脱泡した後、貯溜槽を上方に移動させて落差により該貯溜槽から同一真空度の真空含浸槽に電解液を供給して電解コンデンサ素子に電解液を含浸させるように構成されている。



1

【特許請求の範囲】

【請求項１】　電解コンデンサ素子に電解液を真空中で含浸させる真空含浸槽と前記電解液を貯溜すると共に上下方向に移動自在とした貯溜槽とを前記電解液の供給パイプで連通接続し、前記貯溜槽を真空として該貯溜槽内の前記電解液中の空気を真空脱泡すると同時に電解コンデンサ素子を収容した前記真空含浸槽をも真空とした後、前記貯溜槽を上方向に移動させて該貯溜槽と前記真空含浸槽との上下方向の落差により該真空脱泡された前記電解液を前記貯溜槽から前記真空含浸槽に供給して前記電解液中の空気を脱泡した状態で前記電解コンデンサ素子に前記電解液を含浸させることを特徴とする電解コンデンサ素子の電解液真空含浸方法。

【請求項２】　電解コンデンサ素子を収容して真空中で電解液を含浸させる真空含浸槽と、前記電解液を貯溜すると共に内部の圧力を真空とすることにより前記電解液中の空気を真空脱泡して前記真空含浸槽に前記電解液を供給しまた前記真空含浸槽から前記電解液を回収する貯溜槽と、該貯溜槽及び前記真空含浸槽のいずれかを上下方向に移動させて前記貯溜槽と前記真空含浸槽との落差により前記真空含浸槽に前記電解液を供給しまた前記真空含浸槽から前記電解液を回収する移送装置と、前記真空含浸槽と前記貯溜槽内の圧力を所定のタイミングに従って真空とする真空装置とを備えたことを特徴とする電解コンデンサ素子の電解液真空含浸装置。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、電解コンデンサ素子の電解液真空含浸方法及び装置に係り、特に真空とした貯溜槽内で電解液中の空気を真空脱泡した後、貯溜槽を上方に移動させて落差により該貯溜槽から同一真空度の真空含浸槽に電解液を供給して電解コンデンサ素子に電解液を含浸させることにより、真空含浸槽に供給される電解液の沸騰を抑えて電解コンデンサ素子のリード線に電解液が付着しないようにし、また気泡の発生を抑制し得るようにした電解コンデンサ素子の電解液真空含浸方法及び装置に関する。

【０００２】

【従来の技術】従来、複数の電解コンデンサ素子のリード線をクランプ治具によって整列挟持して電解コンデンサ素子を真空含浸槽内に搬送して、該真空含浸槽内を真空状態にして電解コンデンサ素子の本体内部の空気を排除した後、電解液を供給してこれを該素子の本体内部に含浸させる方法及び装置が実用に供されている。

【０００３】しかし、該従来方法及び装置によると、真空含浸槽に供給される電解液は大気中に開放されていて、該液内部に空気を含んでいるため、該電解液が真空とされた真空含浸槽へ供給されたとき、該液内部に含まれている空気が細かい気泡となって拡散してその一部が電解コンデンサ素子内部へ電解液と共に侵入してピンホール状の未含浸部分を形成してしまい、該素子を用いた電解コンデンサの電気的特性を劣化させるという欠点があった。

2

【０００４】また真空含浸槽内において電解液中の空気が急速に泡となって拡散するので、該電解液が沸騰状態となって各部に飛び跳ね、例えばリード線に付着して後工程での半田付け作業での半田付け不良の原因となる欠点があった。またこのことが、自動組立機の稼働率を低下させる原因ともなっていた。

【０００５】更に、電解液の脱泡が真空含浸槽内で行われるため、真空含浸槽内の圧力を必要とする真空度にまで高めるのに比較的長い時間を要して含浸作業の作業効率が低下すると共に、大型の電解コンデンサ素子の中心部にまで十分電解液を含浸させることができないという欠点があった。

【０００６】またこのような現象は高耐圧の電解コンデンサに使用される粘度の高い電解液においては著しく、粘度の高い電解液を含浸させるためには大型の装置を用いなければならないという欠点があった。また、真空含浸の終了した後真空含浸槽内の残余の電解液を貯溜槽へ返送するためダイヤフラム式ポンプを備えていたので、装置が大型となると共に製作費が高価となる欠点があった。

【０００７】

【発明が解決しようとする課題】本発明は，上記した従来技術の欠点を除くためになされたものであって、その目的とするところは、真空とした貯溜槽で電解液中の空気を真空脱泡した後、該電解液を真空含浸槽へ落差により供給することによって、電解液の沸騰現象及び気泡の混入を抑制して電解液の含浸効率を向上させると共に、リード線及び粘着テープ等に電解液が付着するのを完全に防止し、これによって粘着テープの繰り返し使用を可能とし、また後工程での半田付け作業での半田付け性能を向上させ、更に電解コンデンサ自動組立機を清浄な状態に保持することである。

【０００８】また他の目的は、上記構成により、比較的小型の装置を用いて粘度の高い電解液を大型の電解コンデンサ素子の中心部にまで十分含浸させ、高耐圧の電解コンデンサ素子を製作できるようにすることである。更に他の目的は、十分に高い真空度に調整された真空含浸槽内で電解コンデンサ素子に含浸を行わせることにより、電解液の含浸性能そのものを向上させることである。

【０００９】

【課題を解決するための手段】要するに本発明方法（請求項１）は、電解コンデンサ素子に電解液を真空中で含浸させる真空含浸槽と前記電解液を貯溜すると共に上下方向に移動自在とした貯溜槽とを前記電解液の供給パイプで連通接続し、前記貯溜槽を真空として該貯溜槽内の前記電解液中の空気を真空脱泡すると同時に電解コンデ

ンサ素子を収容した前記真空含浸槽をも真空とした後、前記貯溜槽を上方向に移動させ該貯溜槽と前記真空含浸槽との上下方向の落差により該真空脱泡された前記電解液を前記貯溜槽から前記真空含浸槽に供給して前記電解液中の空気を脱泡した状態で前記電解コンデンサ素子に前記電解液を含浸させることを特徴とするものである。

また本発明装置（請求項２）は、電解コンデンサ素子を収容して真空中で電解液を含浸させる真空含浸槽と、前記電解液を貯溜すると共に内部の圧力を真空とすることにより前記電解液中の空気を真空脱泡して前記真空含浸槽に前記電解液を供給しまた前記真空含浸槽から前記電解液を回収する貯溜槽と、該貯溜槽及び前記真空含浸槽のいずれかを上下方向に移動させて前記貯溜槽と前記真空含浸槽との落差により前記真空含浸槽に前記電解液を供給しまた前記真空含浸槽から前記電解液を回収する移送装置と、前記真空含浸槽と前記貯溜槽内の圧力を所定のタイミングに従って真空とする真空装置とを備えたことを特徴とするものである。

【００１０】

【実施例】以下本発明を図面に示す実施例に基いて説明する。本発明に係る電解コンデンサ素子の電解液真空含浸装置１は、図１から図６を参照して、真空含浸槽２と、貯溜槽３と、移送装置４と、真空装置５とを備えている。真空含浸槽２は、クランプ治具６により電解コンデンサ素子８のリード線８ａが挟持されて搬送される複数の電解コンデンサ素子８を収容して真空にされ、その中に電解液９が供給されて該電解液が電解コンデンサ素子８に含浸されるようにしたものであって、高品質のアルミニウム合金鋳物等の材料で製作されており、箱形状の含浸槽本体１０と密閉蓋１１とから構成されている。含浸槽本体１０には図示しないＯリングが装着され、密閉蓋１１が装着されたとき、密閉蓋１１との機密性を保持して内部を高真空度に保つようになっている。

【００１１】含浸槽本体１０内には液室１０ａが配設されていて、液室１０ａ内に電解液９を注入して電解コンデンサ素子８に含浸させるようになっている。また液室１０ａ内には電解コンデンサ素子８の素子部８ｂを挟持する挟持部材１２が配設されていて、含浸される電解コンデンサ素子８が動かないように保持するようになっている。また密閉蓋１１には、蓋開閉装置１３が装着されていて駆動装置１７により密閉蓋１１を開閉して、電解コンデンサ素子８を含浸槽本体１０内に対して搬入及び搬出できるようになっている。

【００１２】貯溜槽３は、電解液９を貯溜すると共に該電解液を真空脱泡して真空含浸槽２へ供給するためのものであって、例えば約５００ｃｃ程度の容量を持つガラス、ポリプロピレン等の樹脂、アルミニウム又はステンレス鋼等の金属で製作された密閉容器であり、内部３ａと真空含浸槽２の液室１０ａとは夫々の底部３ｂ及び１０ｂにおいて供給パイプ１４によって連通接続され、貯

溜された電解液９を互いに供給又は回収できるようになっている。

【００１３】また、内部３ａには貯溜された電解液９の液面高さを検出する液面センサ１５が配設されている。底部３ｂに形成された２個の連通穴３ｃ及び３ｄは各々ホース１６及び１８によりリザーブタンク１９と連通接続され、電解液９の供給側連通穴３ｄには貯溜槽３に貯溜された電解液９の上方に開口するパイプ２０が接続され、電解液９の液面高さが所定の高さよりも低くなると、リザーブタンク１９から電解液９がホース１８、パイプ２０を介して貯溜槽３に貯溜された電解液９を上方から矢印Ａ方向に供給するようになっている。

【００１４】また上部３ｅには、ホース２１及びフィルタ２２を介して真空度センサ２３が配設されており、貯溜槽３内部３ａの真空度を検出するようになっている。更に上部３ｅには、十字接ぎ手２４が装着され、該十字接ぎ手２４は、ホース２５、２６によって、密閉蓋１１及び真空とされた内部を大気と連通させることにより大気圧にもどすための空気導入バルブ２９と連通接続され、更にホース２８によって２個の真空バルブ３０、３１を介して空気中に含まれる電解液９を分離して真空装置５が該電解液により汚染されるのを防止する脱液用真空チャンバ３２と連通接続されている。２個の真空バルブ３０、３１の途中は更に分岐されて、ホース２８は、ホース３３により真空装置５と連通接続されている。

【００１５】移送装置４は、貯溜槽３を上下方向に移動させるためのものであって、流体圧シリンダ３４と摺動ガイドブロック３５とから構成されている。流体圧シリンダ３４は、公知の例えばエアシリンダであって、シリンダ３４ａは基台３６に、ピストンロッド３４ｂは貯溜槽３の底部３ｂに固定され、図示しない流体源から圧力流体を流体圧シリンダ３４に供給してピストンロッド３４ｂを矢印Ｂ又はＣ方向に作動させることにより貯溜槽３を上下方向（矢印Ｂ又はＣ方向）に移動させるようになっている。

【００１６】摺動ガイドブロック３５は、貯溜槽３を案内して上下方向（矢印Ｂ又はＣ方向）に移動させるためのものであって、貯溜槽３に固定されたガイドロッド３８が基台３６に固定されたリニヤベアリング３９により案内されて上下方向（矢印Ｂ又はＣ方向）に移動することにより貯溜槽３を案内しながら摺動させるようになっている。ガイドロッド３８には、上方ストッパ４０と下方ストッパ４１とがねじ４２及び４３によって調節可能に固定されており、貯溜槽３の上下移動量を調節できるようになっている。

【００１７】真空装置５は、公知の例えば真空ポンプであって、エアフィルタ４４を介してホース３３に接続され、真空含浸槽２及び貯溜槽３を所定のタイミングで真空にするようになっている。

【００１８】そして本発明方法は、電解コンデンサ素子

８に電解液９を真空中で含浸させる真空含浸槽２と電解液９を貯溜すると共に上下方向に移動自在とした貯溜槽３とを電解液９の供給パイプ１４で連通接続し、貯溜槽３を真空として該貯溜槽内の電解液９中の空気を真空脱泡すると同時に電解コンデンサ素子８を収容した真空含浸槽２をも真空とした後、貯溜槽３を上方向に移動させて該貯溜槽と真空含浸槽２との上下方向の落差により該真空脱泡された電解液９を貯溜槽３から真空含浸槽２に供給して電解液９中の空気を脱泡した状態で電解コンデンサ素子８に電解液９を含浸させる方法である。

【００１９】本発明は、上記のように構成されており、以下その作用について説明する。図１及び図２を参照して、真空バルブ３０が閉じられて真空含浸槽２及び貯溜槽３が大気圧の状態にあるとき、駆動装置１７を作動させて蓋開閉装置１３により密閉蓋１１を開放する。そして複数の電解コンデンサ素子８を整列挟持したクランプ治具６が図示しない搬送装置により真空含浸槽２の上方まで搬送され、密閉蓋１１の開いた含浸槽本体１０内に搬入されて（矢印Ｄ方向）該電解コンデンサ素子の素子部８ｂを挟持部材１２で挟持した後、該電解コンデンサ素子を含浸槽本体１０内に残してクランプ治具６のみが退避する（矢印Ｅ方向）。再び駆動装置１７を作動させて密閉蓋１１を閉めて真空含浸槽２を外気から遮断した後、真空バルブ３０を開き、真空装置５を作動させて真空含浸槽２及び貯溜槽３内の空気を真空装置５によって吸引（矢印Ｉ方向）して真空状態とし、電解液９中の空気を吸引して脱泡する。

【００２０】次いで、図５及び図６も参照して、真空装置５の吸引により貯溜槽３及びこれと連通する真空含浸槽２内の圧力は次第に小さくなり、真空度が約２０トールに達したことが真空度センサ２３により検出されると、該検出信号に応答して真空バルブ３０が閉じらる。ここで流体圧シリンダ３４に図示しない流体源から圧力流体が供給され、ピストンロッド３４ｂを矢印Ｂ方向に作動させて貯溜槽３を上方向（矢印Ｂ方向）に移動させ、貯溜槽３を真空含浸槽２よりも上方に位置させる。

【００２１】すると貯溜槽３内に貯溜されていた脱泡された電解液９は、貯溜槽３と真空含浸槽２との落差によって供給パイプ１４中を矢印Ｆ方向に流れて真空含浸槽２に供給され、液室１０ａに挟持され、内部が真空とされた電解コンデンサ素子８は該電解液中に浸漬される。そしてそのまま所定時間保持されるので、電解コンデンサ素子８の中心部にまで電解液９が浸透する。

【００２２】ここで真空含浸槽２に供給される電解液９は、貯溜槽３で脱泡されており、しかも貯溜槽３と同一の真空度とされた真空含浸槽２に供給されるので、従来の含浸装置のように真空含浸槽２内で沸騰することがなく、リード線８ａ等を電解液９で汚すことがない。

【００２３】所定の含浸時間が経過すると、空気導入バルブ２９を開放して，真空含浸槽２及び貯溜槽３内の圧

力を大気圧とした後、流体圧シリンダ３４に供給されていた圧力流体を遮断して、ピストンロッド３４ｂを矢印Ｃ方向に作動させて貯溜槽３を下方向（矢印Ｃ方向）に移動させる。貯溜槽３を真空含浸槽２よりも下方に位置させて電解コンデンサ素子８に含浸した残余の電解液９を供給パイプ１４中を矢印Ｇ方向に流して真空含浸槽２から貯溜槽３に回収する。

【００２４】ここで、含浸された電解コンデンサ素子８は、電解液９に浸漬された状態で大気圧にもどされるので、電解コンデンサ素子８の内部に気泡が入り込むことは全く起こり得ず、理想的な含浸を行うことができる。

【００２５】そして含浸の終了した電解コンデンサ素子８を真空含浸槽２から搬出するために駆動装置１７を作動させて蓋開閉装置１３により密閉蓋１１を開放する。また、電解コンデンサ素子８に含浸させることにより消費された電解液９は、貯溜槽３内で所定の高さよりも低くなったことを液面センサ１５が検出して、リザーブタンク１９から矢印Ｈ方向にホース１８、パイプ２０を介して貯溜槽３に貯溜された電解液９の上方から矢印Ａ方向に供給され、常に消費された量だけ電解液９が補充されるので、貯溜槽３には一定量の電解液９が確保されており、作業者はリザーブタンク１９へ適宜電解液９を注入するだけでよく、貯溜槽３の電解液９の量に特別の注意を払う必要はない。

【００２６】

【発明の効果】本発明は、上記のように真空とした貯溜槽で電解液中の空気を真空脱泡した後、該電解液を真空含浸槽へ落差により供給するようにしたので、電解液の沸騰現象及び気泡の混入を抑制して電解液の含浸効率を向上させることができる効果があると共に、リード線及び粘着テープ等に電解液が付着するのを完全に防止することができるから、粘着テープの繰り返し使用が可能となり、また後工程の半田付け作業での半田付け性能を向上させ、更には電解コンデンサ自動組立機を清浄な状態に保持することができるという優れた効果が得られる。

【００２７】また比較的小型の装置を用いて粘度の高い電解液を大型の電解コンデンサ素子の中心部にまで十分含浸させ、高耐圧の電解コンデンサ素子を製作できるという効果がある。更には、十分に高い真空度に調整された真空含浸槽内で電解コンデンサ素子に含浸を行わせることができるから、電解液の含浸性能そのものを向上させることができる効果がある。

【図面の簡単な説明】

【図１】電解コンデンサ素子の電解液真空含浸装置を示す斜視図である。

【図２】電解コンデンサ素子の電解液真空含浸装置を示す正面図である。

【図３】電解コンデンサ素子の電解液真空含浸装置を示す平面図である。

【図４】貯溜槽と周辺の各装置との接続状態を示す要部

正面図である。

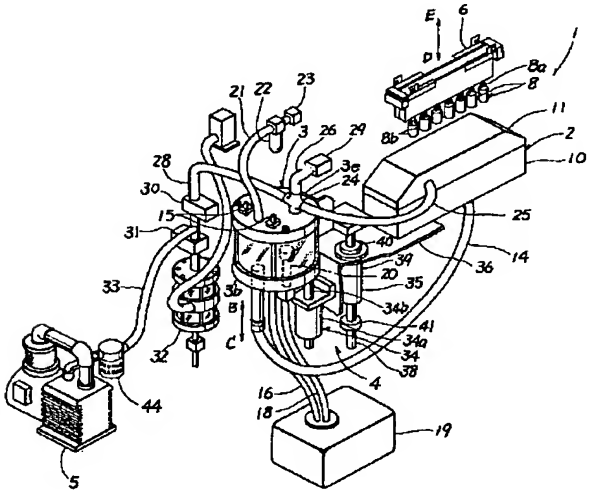
【図５】電解液が真空含浸槽から貯溜槽に回収される状態を示す要部拡大縦断面図である。

【図６】電解液が貯溜槽から真空含浸槽に供給される状態を示す要部拡大縦断面図である。

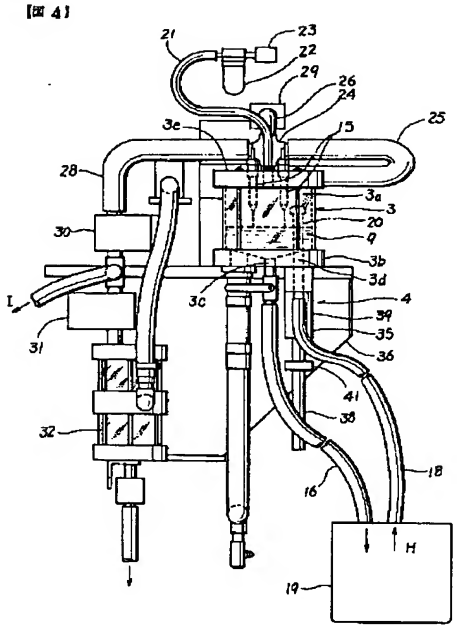
【符号の説明】

1	電解コンデンサ素子の電解液真空含浸装置	＊２	真空含浸槽
		3	貯溜槽
		4	移送装置
		5	真空装置
		8	電解コンデンサ素子
		9	電解液
		＊１４	供給パイプ

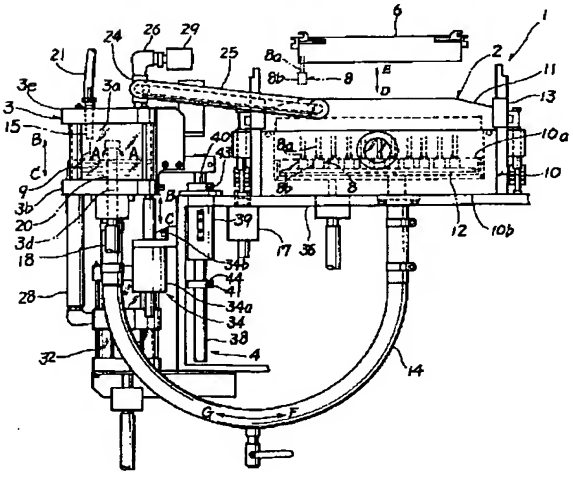
【図１】



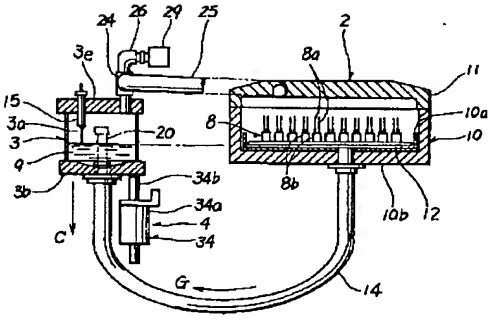
【図４】



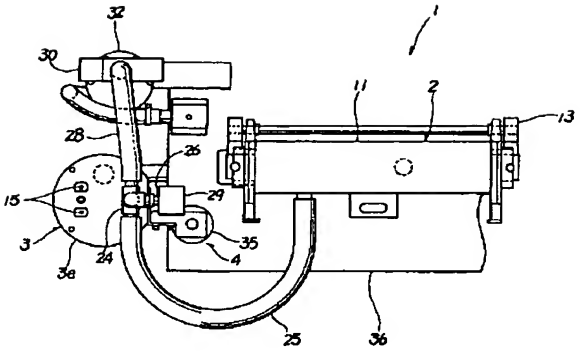
【図２】



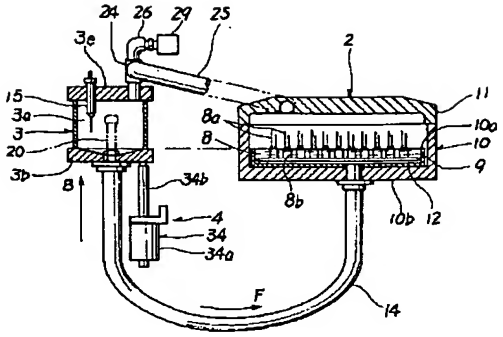
【図５】



【図３】

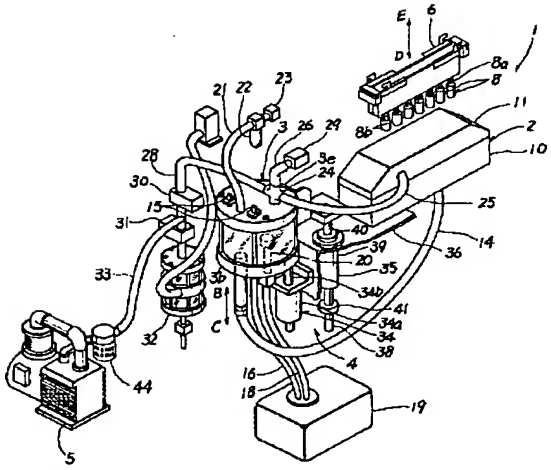


【図６】

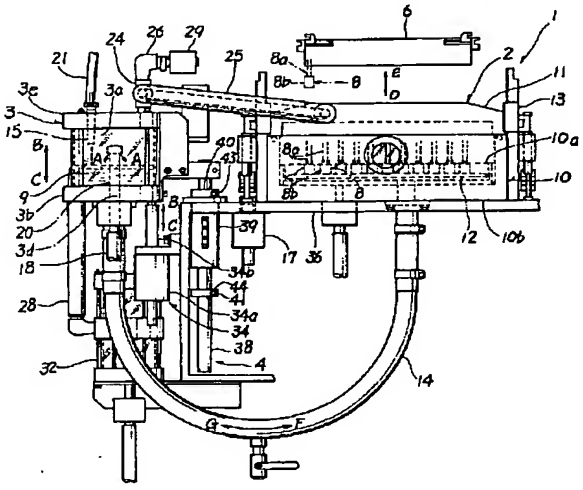


【手続補正書】
【提出日】平成６年５月１２日
【手続補正１】
【補正対象書類名】図面　＊
＊【補正対象項目名】全図
【補正方法】変更
【補正内容】

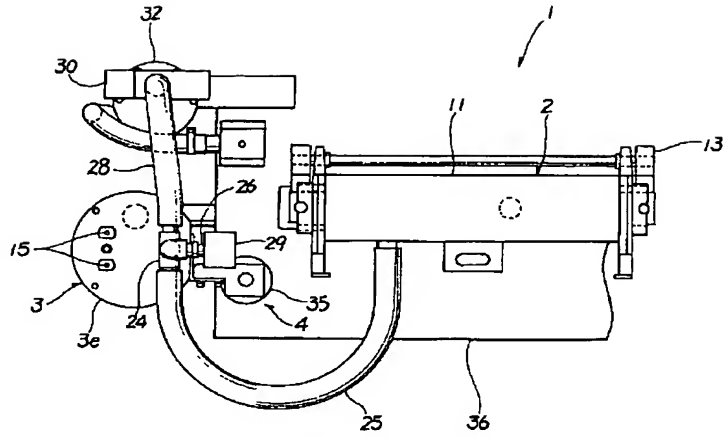
【図１】



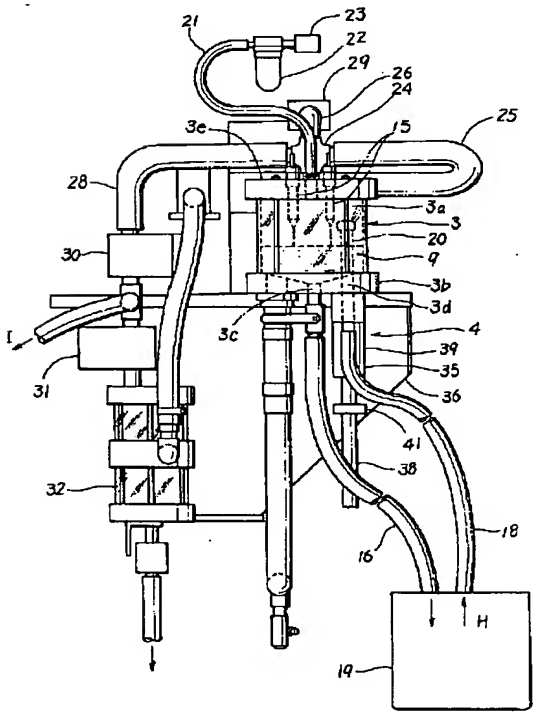
【図２】



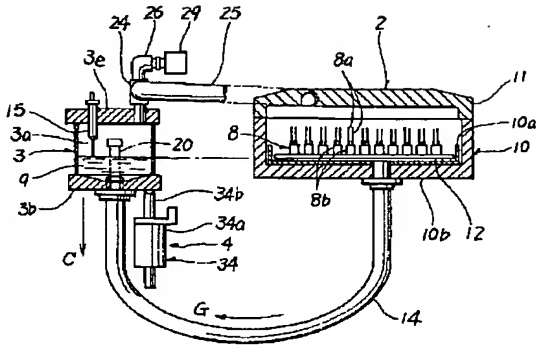
【図３】


32
30
1
11
2
13
28
26
29
15
3
35
4
24
3e
25
36

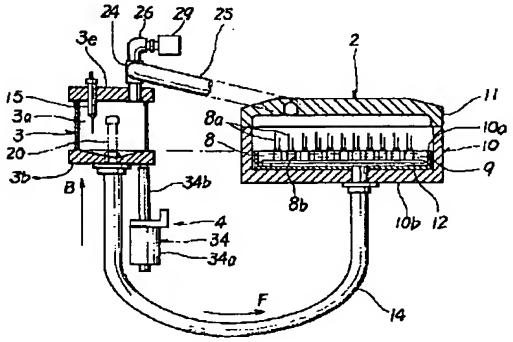
【図４】


21
23
22
29
26
24
25
3e
15
28
3a
3
20
9
30
3b
3d
I
3c
4
39
31
35
36
41
38
32
18
16
H
19

【図５】


24
26
29
25
2
3e
8a
11
15
3a
20
8
10a
3
10
9
34b
8b
3b
34a
10b
12
4
C
34
G
14

【図６】


24
26
29
25
3e
2
15
11
3a
8a
10a
3
8
20
10
3b
9
B
34b
8b
4
10b
12
34
34a
F
14

(11)Publication number : 06-318535 (51)Int.CI. H01G 9/02
(43)Date of publication of application : 15.11.1994 H01G 13/00

(21)Application number : 03-072311
(22)Date of filing : 11.03.1991

(71)Applicant : J C C ENG KK
CKD CORP
(72)Inventor : KOMATA KATSUMORI

(54) **METHOD AND APPARATUS FOR VACUUM ELECTROLYTE INPREGNATION FOR ELECTROLYTIC CAPACITOR ELEMENT**

(57)Abstract:
PURPOSE: To keep clean an electrolytic capacitor automatic assembling machine and moreover improve solderability by supplying the vacuum debubbled electrolyte to a vacuum impregnation tank under the same vacuum degree in order to improve impregnation efficiency of the electrolyte and to perfectly prevent adhesion of electrolyte on lead wires and adhesive tapes through suppression of the boiling phenomenon of vacuum debubbled electrolyte and mixture of bubbles.
CONSTITUTION: The electrolyte is vacuum debubbled to eliminate air content within a reservoir tank 3 under the vacuum condition. Thereafter, the reservoir tank 3 is moved upward to supply the electrolyte to a vacuum impregnation tank 2 under the same vacuum degree from the reservoir tank 3 utilizing the difference of height in view of impregnating an electrolytic capacitor element 8 with the electrolyte.

CLAIMS

[Claim(s)]
[Claim 1]Free passage connection of the reservoir whose migration in the vertical direction was enabled while storing the vacuum impregnation tub which carries out impregnation of the electrolytic solution to an electrolytic capacitor component in a vacuum, and said electrolytic solution is made with the delivery pipe of said electrolytic solution. After also making into a vacuum said vacuum impregnation tub which held the electrolytic capacitor component at the same time it carries out vacuum degassing of the air in said electrolytic solution in this reservoir by making said reservoir into a vacuum, Said reservoir is moved upward. By the fall of the vertical direction of this reservoir and said vacuum impregnation tubThe electrolytic-solution vacuum impregnation approach of the electrolytic capacitor component characterized by carrying out impregnation of said electrolytic solution to said electrolytic capacitor component where it supplied this said electrolytic solution by which vacuum degassing was carried out from said reservoir to said vacuum impregnation tub and degassing of the air in said electrolytic solution is carried out.
[Claim 2]The vacuum impregnation tub to which an electrolytic capacitor component is held and impregnation of the electrolytic solution is carried out in a vacuum, The reservoir which carries out vacuum degassing of the air in said electrolytic solution, supplies said electrolytic solution to said vacuum impregnation tub, and collects said electrolytic solutions from said vacuum impregnation tub by making an internal pressure into a vacuum again while storing said electrolytic solution, The concrete supply system which is made to move either this reservoir and said vacuum impregnation tub in the vertical direction, supplies said electrolytic solution to said vacuum impregnation tub by the fall of said reservoir and said vacuum impregnation tub, and collects said electrolytic solutions from said vacuum impregnation tub again, Electrolytic-solution vacuum impregnation equipment of the electrolytic capacitor component characterized by having the vacuum devices which make a vacuum the pressure in said vacuum impregnation tub and said reservoir according to predetermined timing.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application]This invention relates to the electrolytic-solution vacuum impregnation approach and equipment of an electrolytic capacitor component. By moving a reservoir up, supplying the electrolytic solution to the vacuum impregnation tub of the same degree of vacuum from this reservoir by fall, and carrying out impregnation of the electrolytic solution to an electrolytic capacitor component, after carrying out vacuum degassing of the air in the electrolytic solution in the reservoir made especially into the vacuumIt is related with the electrolytic-solution vacuum impregnation approach and equipment of an electrolytic capacitor component which suppress ebullition of the electrolytic solution supplied to a vacuum impregnation tub, and it is made for the electrolytic solution not to adhere to the lead wire of an electrolytic capacitor component, and enabled it to control generating of air bubbles.

[0002]
[Description of the Prior Art]Conventionally, practical use is presented with the approach and equipment which the electrolytic solution is supplied [equipment] and carry out impregnation of this to the interior of the body of this component,

after carrying out alignment pinching of the lead wire of two or more electrolytic capacitor components with a clamp fixture, conveying an electrolytic capacitor component in a vacuum impregnation tub, making the inside of this vacuum impregnation tub into a vacua and eliminating the air inside the body of an electrolytic capacitor component.

[0003]However, since according to this conventional approach and equipment the electrolytic solution supplied to a vacuum impregnation tub is opened in atmospheric air and air is included inside this liquid, When this electrolytic solution is supplied to the vacuum impregnation tub made into the vacuum, the air included inside this liquid serves as fine air bubbles, and diffuses, and the part trespasses upon the interior of an electrolytic capacitor component with the electrolytic solution, and forms a pinhole-like non-impregnation part. There was a fault of degrading the electrical characteristics of the electrolytic capacitor using this component.

[0004]Moreover, since the air in the electrolytic solution became a bubble quickly and diffused in the vacuum impregnation tub, there was a fault which this electrolytic solution will be in an ebullition condition, and flies and bounds on each part, for example, adheres to lead wire, and causes poor soldering in a soldering activity at an after process. Moreover, this had also become the cause of reducing the operating ratio of an automatic assembly machine.

[0005]Furthermore, since degassing of the electrolytic solution is performed within a vacuum impregnation tub, while taking comparatively long time amount to raise even to the degree of vacuum which needs the pressure in a vacuum impregnation tub and the working efficiency of an impregnation activity falling, even the core of a large-sized electrolytic capacitor component had the fault that impregnation of the electrolytic solution could not be carried out enough.

[0006]Moreover, such a phenomenon was remarkable in the electrolytic solution with the high viscosity used for the electrolytic capacitor of high pressure-proofing, and in order to carry out impregnation of the electrolytic solution with high viscosity, it had the fault that large-sized equipment had to be used. Moreover, since it had the diaphragm-type pump in order to return the electrolytic solution of the remainder in a vacuum impregnation tub to a reservoir after vacuum impregnation is completed, while equipment became large-sized, there was a fault from which a manufacturing cost becomes expensive.

[0007]

[Problem(s) to be Solved by the Invention]The place which it is made in order that this invention may remove the fault of the above-mentioned conventional technique, and is made into the objectAfter carrying out vacuum degassing of the air in the electrolytic solution in the reservoir made into the vacuum, while controlling bubbling of the electrolytic solution, and mixing of air bubbles and raising the impregnation effectiveness of the electrolytic solution by supplying this electrolytic solution to a vacuum impregnation tub by fallIt is preventing thoroughly the electrolytic solution adhering to lead wire, adhesive tape, etc., and enabling the repeat activity of adhesive tape by this, and raising the soldering engine performance in a soldering activity at an after process, and holding an electrolytic capacitor automatic assembly machine in the pure condition further.

[0008]Moreover, other objects are making even the core of a large-sized electrolytic capacitor component carry out impregnation of the electrolytic solution with high viscosity enough using comparatively small equipment, and enabling it to manufacture the electrolytic capacitor component of high pressure-proofing by the above-mentioned configuration. Furthermore, other objects are raising the impregnating ability ability of the electrolytic solution itself by making impregnation perform for an electrolytic capacitor component within the vacuum impregnation tub adjusted to the degree of vacuum high enough.

[0009]
[Means for Solving the Problem]In short, this invention approach (claim 1) makes free passage connection of the reservoir whose migration in the vertical direction was enabled while storing the vacuum impregnation tub which carries out impregnation of the electrolytic solution to an electrolytic capacitor component in a vacuum, and said electrolytic solution with the delivery pipe of said electrolytic solution. After also making into a vacuum said vacuum impregnation tub which held the electrolytic capacitor component at the same time it carries out vacuum degassing of the air in said electrolytic solution in this reservoir by making said reservoir into a vacuum, Said reservoir is moved upward. By the fall of the vertical direction of this reservoir and said vacuum impregnation tubIt is characterized by carrying out impregnation of said electrolytic solution to said electrolytic capacitor component, where it supplied this said electrolytic solution by which vacuum degassing was carried out from said reservoir to said vacuum impregnation tub and degassing of the air in said electrolytic solution is carried out. Moreover, the vacuum impregnation tub to which this invention equipment (claim 2) holds an electrolytic capacitor component, and impregnation of the electrolytic solution is carried out in a vacuum, The reservoir which carries out vacuum degassing of the air in said electrolytic solution, supplies said electrolytic solution to said vacuum impregnation tub, and collects said electrolytic solutions from said vacuum impregnation tub by making an internal pressure into a vacuum again while storing said electrolytic solution, The concrete supply system which is made to move either this reservoir and said vacuum impregnation tub in the vertical direction, supplies said electrolytic solution to said vacuum impregnation tub by the fall of said reservoir and said vacuum impregnation tub, and collects said electrolytic solutions from said vacuum impregnation tub again, It is characterized by having the vacuum devices which make a vacuum the pressure in said vacuum impregnation tub and said reservoir according to predetermined timing.
[0010]
[Example]This invention is explained based on the example shown in a drawing below. The electrolytic-solution vacuum impregnation equipment 1 of the electrolytic capacitor component concerning this invention is equipped with the vacuum impregnation tub 2, a reservoir 3, a concrete supply system 4, and vacuum devices 5 with reference to drawing 6 from drawing 1. The vacuum impregnation tub 2 **** two or more electrolytic capacitor components 8 which lead-wire 8a of the electrolytic capacitor component 8 is pinched with the clamp fixture 6, and are conveyed, and is made into a vacuum. The electrolytic solution 9 is supplied into it, as impregnation of this electrolytic solution is carried out to the electrolytic capacitor component 8, it is manufactured with ingredients, such as an aluminum alloy casting of high quality, and it consists of cube type-like the impregnation tub bodies 10 and the sealing lids 11. When the impregnation tub body 10 is equipped with the O ring which is not illustrated and it is equipped with the sealing lid 11, confidentiality with the sealing lid 11 is held and the interior is maintained at whenever [high vacuum].
[0011]Liquid room 10a is arranged in the impregnation tub body 10, the electrolytic solution 9 is poured in into liquid room 10a, and impregnation is carried out to the electrolytic capacitor component 8. Moreover, in liquid room 10a, the pinching member 12 which pinches component section 8b of the electrolytic capacitor component 8 is arranged, and it holds so that the electrolytic capacitor component 8 by which impregnation is carried out may not move. Moreover, the sealing lid 11 is equipped with lid-open close equipment 13, the sealing lid 11 is opened and closed with a driving gear 17 on it, and the electrolytic capacitor component 8 can be carried in and taken out now to the inside of the impregnation tub body 10 on it.
[0012]A reservoir 3 is for carrying out vacuum degassing of this electrolytic solution, and supplying the vacuum impregnation tub 2, while storing the electrolytic solution 9. For example, resin with the capacity of about 500 cc,

such as glass and polypropylene, It is the well-closed container manufactured with metals, such as aluminum or stainless steel, and internal 3a and liquid room 10a of the vacuum impregnation tub 2 can supply or collect now the electrolytic solutions 9 of each other which free passage connection was made and were stored with the delivery pipe 14 in each pars basilaris ossis occipitalis 3b and 10b.

[0013]Moreover, the liquid level sensor 15 which detects the oil-level height of the stored electrolytic solution 9 is arranged in internal 3a. Free passage connection of the two free passage holes 3c and 3d formed in pars-basilaris-ossis-occipitalis 3b is respectively made with a reserve tank 19 with hose 16 and 18. If the pipe 20 which carries out opening above the electrolytic solution 9 stored by the reservoir 3 is connected to 3d of supply side free passage holes of the electrolytic solution 9 and the oil-level height of the electrolytic solution 9 becomes lower than predetermined heightThe electrolytic solution 9 with which the electrolytic solution 9 was stored by the reservoir 3 through the hose 18 and the pipe 20 from the reserve tank 19 is supplied in the direction of arrow-head A from the upper part.

[0014]Moreover, the degree of vacuum sensor 23 is arranged in up 3e through the hose 21 and the filter 22, and the degree of vacuum of interior of reservoir 3 3a is detected. Up 3e is equipped with the cross-joint patch hand 24. Furthermore, this cross-joint patch hand 24Free passage connection is made with the air installation bulb 29 for returning to an atmospheric pressure by making the interior made into the sealing lid 11 and the vacuum open for free passage with atmospheric air with hose 25 and 26. Furthermore, free passage connection is made with the vacuum chamber 32 for deliquoring which prevents that separate the electrolytic solution 9 contained in air through two vacuum bulbs 30 and 31 with a hose 28, and vacuum devices 5 are polluted with this electrolytic solution. It branches in the middle of two vacuum bulbs 30 and 31 further, and free passage connection of the hose 28 is made with vacuum devices 5 with the hose 33.

[0015]A concrete supply system 4 is for moving a reservoir 3 in the vertical direction, and consists of a hydrostatic pressure cylinder 34 and sliding guide block 35. The hydrostatic pressure cylinder 34 moves a reservoir 3 in the vertical direction (an arrow head B or the direction of C) by supplying a pressure flow object to the hydrostatic pressure cylinder 34 from the source of the well-known fluid which is been an air cylinder, for example, and cylinder 34a is fixed to a pedestal 36, and piston rod 34b is fixed to pars-basilaris-ossis-occipitalis 3b of a reservoir 3, and is not illustrated, and operating piston rod 34b in an arrow head B or the direction of C.
[0016]The sliding guide block 35 is for showing a reservoir 3 and making it move in the vertical direction (an arrow head B or the direction of C), and it is slid, showing a reservoir 3, when the guide rod 38 fixed to the reservoir 3 is guided by the linear bearing 39 fixed to the pedestal 36 and moves in the vertical direction (an arrow head B or the direction of C). The upper part stopper 40 and the lower part stopper 41 **** in a guide rod 38, it is being fixed to it by 42 and 43 possible [accommodation], and the vertical movement magnitude of a reservoir 3 can be adjusted now.
[0017]Vacuum devices 5 are well-known vacuum pumps, and it connects with a hose 33 through an air filter 44, and they make a vacuum the vacuum impregnation tub 2 and a reservoir 3 to predetermined timing.
[0018]And this invention approach makes free passage connection of the reservoir 3 whose migration in the vertical direction was enabled while storing the vacuum impregnation tub 2 and the electrolytic solution 9 which carry out impregnation of the electrolytic solution 9 to the electrolytic capacitor component 8 in a vacuum with the delivery pipe 14 of the electrolytic solution 9. After also making into a vacuum the vacuum impregnation tub 2 which held the electrolytic capacitor component 8 at the same time it carries out vacuum degassing of the air in the electrolytic solution 9 in this reservoir by making a reservoir 3 into a

vacuum, It is the approach of carrying out impregnation of the electrolytic solution 9 to the electrolytic capacitor component 8 where it supplied the electrolytic solution 9 in which was made moving upward in a reservoir 3 and this vacuum degassing was carried out by the fall of the vertical direction of this reservoir and the vacuum impregnation tub 2 from the reservoir 3 to the vacuum impregnation tub 2 and degassing of the air in the electrolytic solution 9 is carried out.

[0019]This invention is constituted as mentioned above and explains the operation below. When the vacuum bulb 30 is closed and the vacuum impregnation tub 2 and a reservoir 3 are in the condition of atmospheric pressure with reference to drawing 1 and drawing 2, a driving gear 17 is operated and the sealing lid 11 is opened with lid-open close equipment 13. And it is conveyed to the upper part of the vacuum impregnation tub 2 by the transport device which the clamp fixture 6 which carried out alignment pinching of two or more electrolytic capacitor components 8 does not illustrate. After being carried in in the impregnation tub body 10 which the sealing lid 11 opened and pinching component section 8b of this (the direction of arrow-head D) electrolytic capacitor component by the pinching member 12, it leaves this electrolytic capacitor component in the impregnation tub body 10, and only the clamp fixture 6 evacuates (the direction of arrow-head E). After operating a driving gear 17 again, shutting the sealing lid 11 and intercepting the vacuum impregnation tub 2 from the open air, the vacuum bulb 30 operates an aperture and vacuum devices 5, air in the vacuum impregnation tub 2 and a reservoir 3 is attracted with vacuum devices 5 (the direction of arrow-head I), it considers as a vacua, and degassing of the air in the electrolytic solution 9 is attracted and carried out.

[0020]Subsequently, for the pressure in the vacuum impregnation tub 2 which also refers to drawing 5 and drawing 6, and is open for free passage with a reservoir 3 and this with attraction of vacuum devices 5, if it is detected by the degree of vacuum sensor 23 that became small gradually and the degree of vacuum amounted to about 20 torrs, it will answer this detecting signal, and the vacuum bulbs 30 are closing **. A pressure flow object is supplied from the source of a fluid which is not illustrated in the hydrostatic pressure cylinder 34 here, piston rod 34b is operated in the direction of arrow-head B, a reservoir 3 is moved upward (the direction of arrow-head B), and a reservoir 3 is located more nearly up than the vacuum impregnation tub 2.

[0021]Then, the electrolytic solution 9 which was stored in the reservoir 3 and by which degassing was carried out flows the inside of a delivery pipe 14 in the direction of arrow-head F by the fall of a reservoir 3 and the vacuum impregnation tub 2, and is supplied to the vacuum impregnation tub 2, and it is pinched by liquid room 10a, and is immersed into this electrolytic solution by the electrolytic capacitor component 8 by which the interior was made the vacuum. And since predetermined time maintenance is carried out as it is, the electrolytic solution 9 permeates even the core of the electrolytic capacitor component 8.

[0022]Since the electrolytic solution 9 supplied to the vacuum impregnation tub 2 here is supplied to the vacuum impregnation tub 2 which degassing is carried out in the reservoir 3 and was moreover made into the same degree of vacuum as a reservoir 3, it is not boiled within the vacuum impregnation tub 2 like the conventional saturator, and does not soil lead-wire 8a etc. with the electrolytic solution 9.

[0023]If predetermined impregnation time amount passes, after opening the air installation bulb 29 and making the pressure in the vacuum impregnation tub 2 and a reservoir 3 into atmospheric pressure, the pressure flow object currently supplied to the hydrostatic pressure cylinder 34 is intercepted, piston rod 34b is operated in the direction of arrow-head C, and a reservoir 3 is moved downward (the direction of arrow-head C). The inside of a delivery pipe 14 is passed in the direction of arrow-head G, and the electrolytic solutions 9 of the remainder which the reservoir 3 was caudad located rather than the vacuum impregnation tub 2, and sank into the electrolytic capacitor component 8 are collected from the

vacuum impregnation tub 2 to a reservoir 3.
[0024]Here, since the electrolytic capacitor component 8 by which impregnation was carried out is returned to an atmospheric pressure in the condition of having been immersed in the electrolytic solution 9, it cannot happen at all that air bubbles enter the interior of the electrolytic capacitor component 8, and ideal impregnation can be performed.
[0025]And in order to take out the electrolytic capacitor component 8 which impregnation ended from the vacuum impregnation tub 2, a driving gear 17 is operated and the sealing lid 11 is opened with lid-open close equipment 13. Moreover, the electrolytic solution 9 consumed by carrying out impregnation to the electrolytic capacitor component 8A liquid level sensor 15 detects having become lower than height predetermined in a reservoir 3. Since the electrolytic solution 9 is filled up, only the amount which was supplied in the direction of arrow-head A, and was always consumed from the upper part of the electrolytic solution 9 stored in the reservoir 3 through the hose 18 and the pipe 20 in the direction of arrow-head H from the reserve tank 19The electrolytic solution 9 of a constant rate is secured in the reservoir 3, and an operator does not need to pay attention special to the amount of the electrolytic solution 9 of a reservoir 3 that what is necessary is just to pour in the electrolytic solution 9 suitably to a reserve tank 19.
[0026]
[Effect of the Invention]Since this invention supplied this electrolytic solution to the vacuum impregnation tub by fall after carrying out vacuum degassing of the air in the electrolytic solution in the reservoir made into the vacuum as mentioned aboveWhile it is effective in the ability to control bubbling of the electrolytic solution, and mixing of air bubbles, and raise the impregnation effectiveness of the electrolytic solutionSince it can prevent thoroughly that the electrolytic solution adheres to lead wire, adhesive tape, etc. The repeat activity of adhesive tape is attained, and the soldering engine performance in the soldering activity of an after process is raised, and the outstanding effectiveness that an electrolytic capacitor automatic assembly machine can be further held in the pure condition is acquired.
[0027]Moreover, even the core of a large-sized electrolytic capacitor component is made to carry out impregnation of the electrolytic solution with high viscosity enough using comparatively small equipment, and it is effective in the ability to manufacture the electrolytic capacitor component of high pressure-proofing. Furthermore, since impregnation can be made to perform for an electrolytic capacitor component within the vacuum impregnation tub adjusted to the degree of vacuum high enough, it is effective in the ability to raise the impregnating ability ability of the electrolytic solution itself.

DESCRIPTION OF DRAWINGS

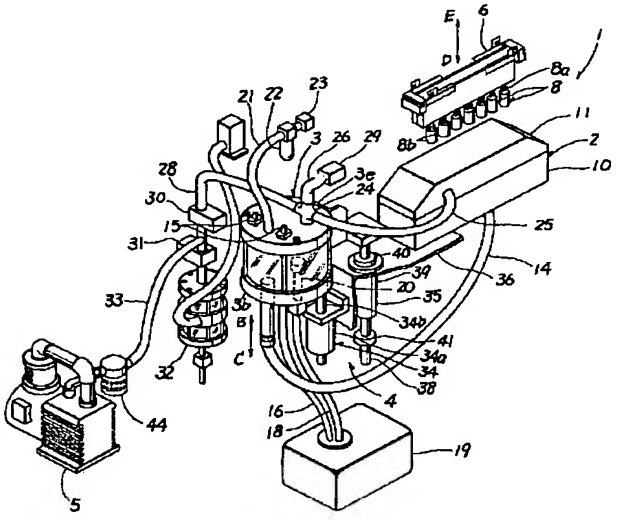
[Brief Description of the Drawings]
[Drawing 1]It is the perspective view showing the electrolytic-solution vacuum impregnation equipment of an electrolytic capacitor component.
[Drawing 2]It is the front view showing the electrolytic-solution vacuum impregnation equipment of an electrolytic capacitor component.
[Drawing 3]It is the top view showing the electrolytic-solution vacuum impregnation equipment of an electrolytic capacitor component.
[Drawing 4]It is the important section front view showing the connection condition of a reservoir and each surrounding equipment.
[Drawing 5]It is the important section enlarged vertical longitudinal sectional view showing the condition that the electrolytic solutions are collected from a vacuum impregnation tub in a reservoir.
[Drawing 6]The electrolytic solution is the important section enlarged vertical

longitudinal sectional view showing the condition that a vacuum impregnation tub is supplied from a reservoir.

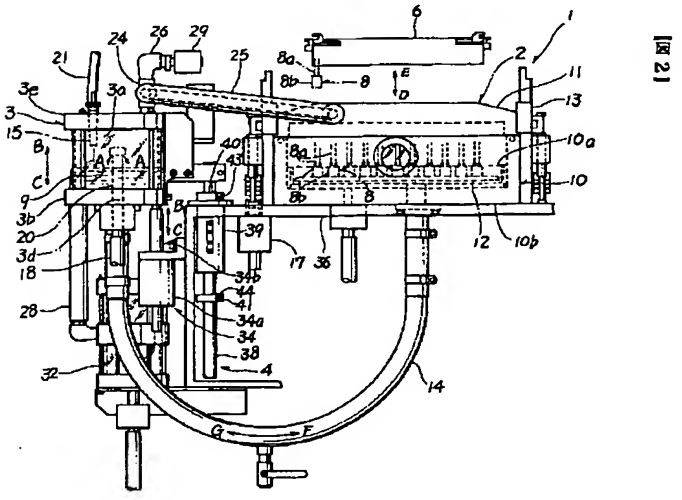
[Description of Notations]

1 Electrolytic-Solution Vacuum Impregnation Equipment of Electrolytic Capacitor Component
2 Vacuum Impregnation Tub
3 Reservoir
4 Concrete Supply System
5 Vacuum Devices
8 Electrolytic Capacitor Component
9 Electrolytic Solution
14 Delivery Pipe

DRAWINGS

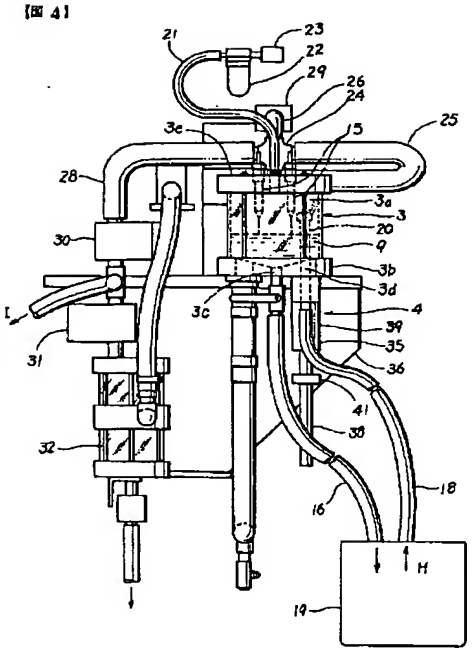


[図1]

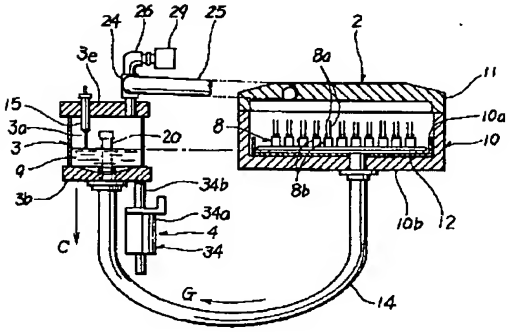


[図2]

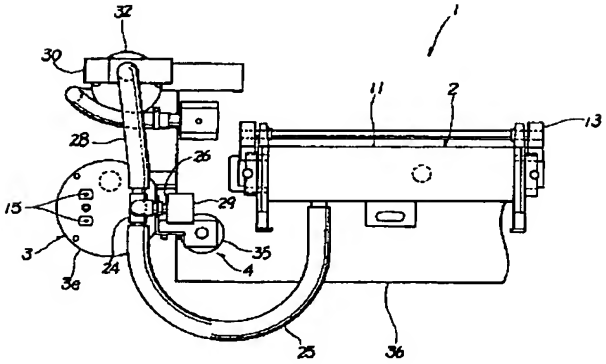
【図４】



【図５】



【図３】



【図８】